CHILD-RESISTANT, MOLDED PLASTIC CLOSURE, PACKAGE INCORPORATING SAME AND CONTAINER THEREFOR

CROSS-REFERENCE TO RELATED APPLICATION

This application is directed to an invention whose aesthetic characteristics are described and claimed in co-pending design application No. D_____ (attorney Docket No. 01692).

FIELD OF THE INVENTION

This invention relates to a child-resistant, molded plastic closure of the squeeze and turn type, to a package incorporating a closure of such character removably applied to a suitably configured finish of a container, and to a container that is adapted for use in such a package.

BACKGROUND OF THE INVENTION

Molded plastic, child-resistant closures of the squeeze and turn type are described, for example, in my commonly-assigned U.S. Patent 5,915,576 (Robinson), the disclosure of which is incorporated by reference herein. Such closures impart child-resistant opening characteristics to containers to which they are applied without being unduly difficult to remove by adults, under Poison Prevention Packaging Act standards, and have been widely and successfully used in the packaging of dry products, for example, consumable pills and tablets. Modifications of such closures have also been successfully used in the packaging of liquid products.

Closures according to the aforesaid '576 patent have been manufactured in a variety of sizes, including 24mm., 28mm., 33mm. and 38mm., by injection molding a polypropylene-based thermoplastic material. Some injection molding problems have occasionally been encountered in injection molding such closures, especially in smaller sizes, in getting the thermoplastic melt to evenly flow, from a melt introduction point centrally

located in the top panel of the closure (element 26 of the aforesaid '576 patent), to locations on an outer sidewall (element 30 of the '576 patent) that are on an axis that extends perpendicularly to an axis between the opposed squeeze pads (elements 90, 92 of the aforesaid '576 patent). These are the locations that require extra melt to fill the child-resistant locking lugs (elements 46, 48 of the aforesaid '576 patent), and extra melt that must flow to these locations creates the potential for outer wall cracking as a result of shrink deformation in unfilled portions of the closure outer wall.

The ramp-shaped locking lugs 46, 48 of the closure of the aforesaid '576 patent, which have a straight locking ledge abutment surface (element 54 of the aforesaid '576 patent), have structural rigidity such that when the closure is applied to a container finish as the closure locking lugs pass over container finish locking lugs (70, 72 of the aforesaid '576 patent), an application torque will be required that is somewhat higher than desired for some applications, although still within applicable industry standards.

Further, the ramp-shaped locking lugs 46, 48 of the closure of the '576 patent, although in compliance with applicable industry standards, can occasionally be overcome by a brute force unlocking torque without deflecting the squeeze pads 90, 92 to remove a closure in a proper, child-resistant fashion. Improvement in the resistance of the closure of the '576 patent to improper brute force removal is also, therefore, a desirable goal of any attempt to improve the closure of the '576 patent.

BRIEF DESCRIPTION OF THE INVENTION

According to the present invention there is provided an improved, single piece, dual wall, molded plastic, squeeze and turn child-resistant closure, a package that is made up of a container with such a closure removably fixed to a suitably-configured finish on a neck on such a container, and a container that is adapted for use in such a package. The closure of the present invention is an improved version of the closure that is described in the aforesaid '576 patent, and the improvement resides in providing a generally U-

shaped recess or indentation in the locking ledge abutment surface (element 54) of the ramp-shaped locking lugs (elements 46, 48) thereof. Such a recess or indentation reduces the amount of thermoplastic melt that must flow to the portions of the outer wall of the closure that are in alignment with the closure locking lugs, and this helps to reduce the potential for outer wall cracking by providing for a more even fill in the closure-forming mold and for reduced shrink deformation in the closure outer wall.

The recess or indentation in each closure locking lug ledge abutment surface, as heretofore described, also has the effect of converting a radially innermost portion of the locking lug to a finger that is flexible with respect to other structure of the locking lug. Such a flexible finger is capable of resiliently yielding in a radially outward direction when the closure locking lug engages a container finish locking lug, during application of the closure to the container, to desirably reduce the torque needed to properly apply a closure to a container. The flexibility of the flexible finger also also improves the resistance of the closure to removal under brute force during an improper attempt to remove the closure by a reverse torque.

Accordingly, it is the object of the present invention to provide an improved molded plastic, child-resistant closure of the squeeze and turn type, and to provide a package that incorporates a container with such a closure removably attached to a suitably configured finish on a neck portion of the container. More particularly, it is the object of the present invention to provide a closure of the aforesaid character that can be injection molded with less potential for outer wall cracking, and to provide a package that is made up of a container with such a closure removably affixed to a suitably-configured finish portion on the neck thereof. Even more particularly, it is an object of the present invention to provide a closure of the aforesaid character that is capable of being removably affixed to a suitably configured finish on a neck portion of a container with reduced application torque and to be more resistant to improper removal from the container under a brute force, reverse torque turning action.

For a further understanding of the present invention and the objects thereof, attention is directed to the drawing and the following brief description thereof, to the detailed description of the invention and to the appended claims.

BRIEF DESCRIPTION OF THE DRAWING

Fig. 1 is a perspective view of a preferred embodiment of a closure according to the present invention;

Fig. 2 is a front elevation view of a container to be used with a closure of Fig. 1;

Fig. 3 is a side elevation view of the container of Fig. 2;

Fig. 4 is a top plane view of the container of Figs. 2 and 3;

Fig. 5 is a bottom plane view of the container of Figs. 2 – 4;

Fig. 6 is an elevation view, partly in cross-section and at an enlarged scale of the closure of Fig. 1 applied to the container of Figs. 2 – 5;

Fig. 7 is a sectional view taken on line 7-7 of Fig. 6; and

Fig. 8 is a fragmentary view, at an enlarged scale, of a portion of the structure that is shown in Fig. 7.

DETAILED DESCRIPTION OF THE INVENTION

A generally cup-shaped, molded plastic, squeeze and turn child-resistant (C/R) closure according to the preferred embodiment of the present invention is identified generally by reference numeral 10 in Fig. 1, where the closure 10 is illustrated in a disassembled state, and in Fig. 6 where the closure 10 is shown as being removably affixed to a container that is generally identified by reference numeral 40. The closure 10 is preferably injection molded in a single, integral piece, except for a separate sealing liner 70 if and when required, and is preferably molded from a suitable thermoplastic material that has a proper balance between rigidity and squeezeability, for reasons that will be hereinafter more fully described. In any case, polypropylene-based thermoplastic materials have been found to be suitable for use in the injection molding of closures in a wide variety of sizes, including 24mm., 28mm., 33mm. and 38mm., which are popular sizes for use in the packaging applications that require C/R removal

characteristics under the Poison Prevention Packaging Act for removal of a closure from an associated container, and these packaging applications include the packaging of various quantities of dry prescription or over-the-counter medications.

The closure 10 is molded with a top panel 12 and spaced-apart concentric inner and outer sidewalls, 14 and 16, respectively, that depend from the top panel 12. The sealing liner 70, if required, as it is for most packaged dry products, is loosely or adhesively affixed to an underside 12a of the top panel 12 of the closure 10. The liner 70 is adapted to seal against a rim 42a of a neck 42 of the container 40 when the closure 10 is properly affixed to the container 40. Alternatively, in place of the liner 70, the underside 12a of the top panel 12 of the closure 10 may be provided with an integral, depending plug (not shown) to seal against an inside of the neck 42 of the container 40, and this will be a suitable construction for a closure 10 that is designed for the packaging of a liquid product in the container 40. Other known types of both lined and unlined closure/container sealing techniques are also contemplated.

The inner sidewall 14 has an inwardly projecting and helically extending thread 18, and the neck 42 of the container 40 has a finish with a complimental, outwardly projecting and helically extending thread 44, whereby the closure 10 may be applied to the container 40 by a turning action and removed from the container 40 by a reverse turning action. The outer sidewall 14 of the closure 10 has an inwardly tapered upper free end 14a, at the juncture of the outer sidewall 14 and the top panel 12, and the outer sidewall 14 extends downwardly from the juncture with the top panel 12 beyond a depending free end 16a of the inner side wall 16 to terminate in an outwardly flared and thickened free end 14a. The free end 14a of the outer side wall 14 of the closure 10 is provided with a diametrically opposed pair of locking lugs 20 that extend inwardly from the outer sidewall 14, and the locking lugs 20 are positioned on an axis that extends perpendicularly to a spaced, opposed pair of pads 22 that project outwardly from the outer

sidewall 14 and extend upwardly from the thickened free end 14a of the outer sidewall 14.

The closure 10 also has a circumferentially spaced plurality of ribs 24 that project outwardly from the inner sidewall 16 to reinforce the sidewall 16 against outward flaring loads. Further, the outer sidewall has spaced pairs of ribs 26 that function as the pairs of ribs 80, 82, 84 and 86 of the aforesaid '576 patent.

During application of the closure 10 to the container 40, which is indicated by the directional arrow A in Fig. 2, the locking lugs 20 of the closure 10 ride over tapered sides 46a of ramp-shaped locking lugs 46 on the neck 42 of the container 40, below the thread 44, and C/R opening characteristics is imparted to the package that is made up of the closure 10 applied to the container 40 by providing the locking lugs 46 with radially extending sides 46b at the ends of the tapered sides 46a. Thus, any attempt to remove the closure 10 from the container 40 simply by unscrewing, in the direction of the arrow B in Figs. 1 and 7, will be blocked by interference between inner free ends 20a of the locking lugs 20 of the closure 10 and the radially extending sides 46b of the locking lugs 46 of the container 40, it being noted that a limited degree of overtravel, for example, 15°, is desirably provided between the free end 20a of each of locking lug 20 and the adjacent radially extending side 46b of the locking lug 40 in the fully applied condition of the closure 10 on the container 40.

The container 40 is preferably produced in a single, integral piece by a conventional blow molding process from a suitable thermoplastic material, for example, high density polyethylene, it being noted that the thread 44 and the locking lugs 46 are formed in a separate neck mold in a conventional manner. When the cross section of a body portion 50 of the container 40 is oval, as shown, for example, in Fig. 4, preferably the locking lugs 46 are positioned with their radially extending sides 46b on an axis that is parallel to the minor axis of the oval. In such case, the pads 22 of the closure 10, when assembled, will be on an axis that is parallel to the major axis of the

container 40, and this will result in maximum spacing of the pads 22 from an outside of the body portion 50 of the container 40, which will enhance the C/R opening characteristics of the closure 10 from the container 40.

To properly remove the closure 10 from a container 40, the closure 10 is squeezed at the locations of the pads 22, and this will temporarily ovalize the outer sidewall 14 of the closure 10 at the location of the locking lugs 20 to move each locking lug 20 radially outwardly so that its interior will lie outwardly beyond the exterior of the adjacent locking lug 46 of the container 40. Thereupon, while still squeezing the closure 10, as described, it can be readily removed from the container 40 by turning it on the container 40 in the direction of the arrow B. The free end 20a of each locking lug 20 of the closure 10 that faces the radially extending side 46b of the locking lug 46 of the container 10, in the position of the closure 10 on the container 40 that is shown in Fig. 7, has a generally U-shaped inwardly projecting recess or indentation 20b therein, and the recess or indentation 20b thereby forms a flexible finger 20c in a radially innermost portion of the locking lug 20. The presence of the finger 20b in the locking lug 20 reduces the mass of thermoplastic melt that must flow from an injection point, which will be at the center of the top panel 12 of the closure 10, to the regions of the outer sidewall 14 of the closure 10 from which the locking lugs 20 project, and this difference from the locking lugs 46, 48 of the aforesaid '576 patent will help to more evenly fill the closure injection mold, which will reduce shrink deformation in the outer sidewall 14 of the closure 10; this difference will also reduce the potential for cracking in the outer sidewall 14 of the closure 10, which is higher in smaller diameter closures. Further, the flexibility of the finger 20c of each locking lug 20 will help to reduce the torque required to properly affix a closure 10 to an associated 40 by the ability of the finger 20c to flex radially outwardly during application, and it will also improve the resistance of the closure 10 to improper, brute force removal from the container 40.

Although the best mode contemplated by the inventor for carrying out the present invention as of the filing date hereof has been shown and described herein, it will be apparent to those skilled in the art that suitable modifications, variations and equivalents may be made without departing from the scope of the invention, such scope being limited solely by the terms of the following claims and the legal equivalents thereof.